Philadelphia University	PHILADELPHIA UNIVERSITY THE WAY TO THE FUTURE	**Approval date:**
Faculty: Science		**Issue:**
Department: Biotechnology and Genetic Engineering		**Credit hours: 2**
Academic year 2022-2023	**Course Syllabus**	**Bachelor**

Course information

Course#	Course title	Prerequisite
0240482	**Applied Molecular Biology**	240386

Course type	Class time	Room #
☐ University Requirement ☐ Faculty Requirement ☒ Major Requirement ☐ Elective ☒ Compulsory	**9:45-10:35 am ST**	**2901**

Instructor Information

Name	Office No.	Phone No.	Office Hours	E-mail
Prof. Raida Khalil	**914**	**ext. 2250**	**TW: 11:35am-15:00 pm**	**R_khalil@philadelphia.edu.jo**

Course Delivery Method

Course Delivery Method			
☒ **Physical**	☐ **Online**	☐ **Blended**	
Learning Model			
Precentage	**Synchronous**	**Asynchronous**	**Physical**
			100%

Course Description

For the Fourth Year, this module serves as a significant (Mandatory) departmental course. The transmission of genetic information from DNA through RNA to proteins is referred to as the "Central Dogma" of biology. There are several existing and future applications to business, academia, and research within each of these processes. The techniques employed in diverse biotechnology applications, such as the treatment of human diseases, agricultural production, and resolving Molecular Aspects, will be thoroughly studied in this advanced course in applied molecular biology. Additionally, new ideas from research in Molecular Biology tools and genomics will be presented. The majority of these recently released, peer-reviewed research journal papers, which will also serve as the foundation for student presentations, will be used to explain all of these quickly moving issues.

Course Learning Outcomes

Number	Outcomes	Corresponding Program outcomes
Knowledge		
K1	Demonstrate an understanding of how DNA can be artificially manipulated to modify an organism's structure and/or function	**K_P1**
K2	Understand the many different applications of molecular biology	**K_P3**
K3	Expose to latest technology tools in molecular biology conducted in many disciplines	**K_P1**
Skills		
S1	Critique and professionally present primary literature articles in the general Molecular Biology technologies	**S_P4**
S2	Assigned original article will hand in to students week ahead the group discussion	**S_P4**
S3	learn how to present and discuss molecular biology research data to an audience.	**S_P2**
Competencies		
C1	critically review the fundamental and key concepts of Molecular Biology and gene cloning	C_P1
C2		C_P1

Learning Resources

Course textbook	**Molecular Biology" 5th edition, 2012 -** **Author(s)/Editor(s): Robert Weaver** **Publisher: Mc Graw Hill** **ISBN: 978-0-07-131686** **Molecular Cell Biology** **Author(s): Lodish, A. Berk et al , 9th edition (2021)** **Publisher: W. H. Freeman and Company** **ISBN: 978-1-4641-87445 (8th edition)** CRISPR Gene Editing : Methods and Protocols **Authors:** Aarhus, Denmark and Yonglun Luo ISSN 1064-3745 ISSN 1940-6029 (electronic) **Publisher:** Springer , part of Springer Nature 2019
Supporting References	**Recent literature(suggested readings and web sites required for assignments through Philadelphia library resources,**
Supporting websites	https://pubmed.ncbi.nlm.nih.gov
Teaching Environment	☒**Classroom** ☐ **laboratory** ☐**Learning platform** ☐**Other**

Meetings and subjects timetable

Week (s)	Topic	Learning Methods	Tasks	Learning Material
1	**Discuss Course Syllabus** **Revision :** **Producing a protein from DNA involves both transcription and translation**	lectures + learning platform + Discussion	Revision Background related to topic Assessment	**Chapter 3 Weaver 5th edition**
2	**The Nature of Genetic Material** -Molecular cloning, methods and tools for -studying genes and gene activity -Introduction to gene manipulation: DNA cloning, restriction enzymes and physical maps	lectures + learning platform + Discussion	**Assessment**	**Chapter 2** **Weaver 4th edition**
3	**Molecular Cloning Methods**	lectures + learning platform + Discussion	**Assessment**	**Chapter 4 Weaver Chapter 6 Lodish**
4		**Lecture** problem solving based learning	**Assessment Article assigned**	**Chapter 4 Weaver Chapter 6 Lodish**
5	**Molecular cloning, , expression, Vectors** PCR, Real time PCR	**Lectures+** , problem solving based learning	**Presentation According to assigned schedule**	**Chapter 4 Weaver Chapter 6 Lodish**
6	Molecular tools for studying genes and gene activity Introduction to gene manipulation: DNA cloning, restriction enzymes and physical maps	**Lectures+** , problem solving based learning	**Assessment Article assigned**	
7				
8	**Overview: Transcription &posttranscriptional modifications, Blotting techniques** Midterm	**Lectures+** , problem solving based learning	**Assessment Article assigned**	
9	Mapping transcripts:-Primer extension, S1 mapping Quantifying transcripts	**Lectures+** , problem solving based learning Collaborative learning	**Assessment Article assigned**	
10	Nuclear run off and ON, Measuring transcription in vivo	**Lectures+** , flipped Class	**Assessment Article assigned**	
11	Overview: Translation	**Lectures+** , problem solving based learning	**Assessment Article assigned**	
12	Western Blot Two- dimensional gel electrophoresis-Proteomics **Immune assay** Overview: Control of gene expression			

	Assaying DNA-protein interaction			
13	Overview: Control of gene expression Foot –Printing Linker scanning analysis Reporter genes: luciferase,GUS,GFP CAT	**Lectures+** , problem solving based learning	**Assessment Article assigned**	
14	Microarray RNA polymerase structure as a specificity Factor the function of σ Binding of RNA polymerase to promoters	**Lectures+** , problem solving based learning	**Assessment**	
15	DNA replication: Detailed Mechanism speed of Replication initiation Elongation: the β clamp	**Lectures+** , problem solving based learning flipped Class	**Article assigned Video**	
16	**Final Exam**			

* includes: Lecture, flipped Class, project- based learning, problem solving based learning, collaborative learning

Course Contributing to Learner Skill Development

Using Technology
Educated videos, Links related to topics ; **Learning Analysis Journals** ; presentations prepared by students
Communication skills
Discussion assigned articles by collaborative learning
Application of concepts learnt
At the end of each topics students will expose to the medical and pharmaceutical applications of different concepts of Molecular Biology

Assessment Methods and Grade Distribution

Assessment Methods	Grade Weight	Assessment Time (Week No.)	Link to Course Outcomes
Mid Term Exam	**% 30**	**Week 8**	**K1 and C1**
Various Assessments *	**% 30**	**Each week**	**All**
Final Exam	**% 40**	**Week 16**	**All**
Total	**%100**		

* includes: quiz, in class and out of class assignment, presentations , reports, videotaped assignment, group or individual projects.

Alignment of Course Outcomes with Learning and Assessment Methods

Number	Learning Outcomes	Learning Method*	Assessment Method**
Knowledge			
K1	Demonstrate an understanding of how DNA can be artificially manipulated to modify an organism's structure and/or function	Lecture problem solving based learning	Quiz videotaped assignment
K2	Understand the many different applications of molecular biology	Lecture problem solving based learning llaborative learning	**Assignment Quiz**
K3	Expose to latest technology tools in molecular biology conducted in many disciplines	Lecture problem solving based learning llaborative learning	**Assignment Quiz Presentation**
Skills			
S1	Critique and professionally present primary literature articles in the general Molecular Biology	problem solving based learning llaborative learning	Quiz videotaped assignment
S2	Assigned original article will hand in to students week ahead the group discussion	flipped Class	assignment Quiz videotaped assignment
S3	Predict the consequences of various types of mutations on gene expression and organism's viability.	flipped Class collaborative learning	Assignment **Presentation**
Competencies			
C1	Critique and professionally present primary literature articles in the general Molecular Biology technologies	collaborative learning	**Quiz**

* includes: Lecture, flipped Class, project- based learning , problem solving based learning, collaborative learning

** includes: quiz, in class and out of class assignment , presentations , reports, videotaped assignment, group or individual projects.

Course Polices

Policy	Policy Requirements
Passing Grade	The minimum passing grade for the course is (50%) and the minimum final mark recorded on transcript is (35%).
Missing Exams	• Missing an exam without a valid excuse will result in a zero grade to be assigned to the exam or assessment. • A Student who misses an exam or scheduled assessment, for a legitimate reason, must submit an official written excuse within a week from the an exam or assessment due date. • A student who has an excuse for missing a final exam should submit the excuse to the dean within three days of the missed exam date.
Attendance	The student is not allowed to be absent more than (15%) of the total hours prescribed for the course, which equates to six lectures days (M, W) and seven lectures (S,T,R). If the student misses more than (15%) of the total hours prescribed for the course without a satisfactory excuse accepted by the dean of the faculty, s/he will be prohibited from taking the final exam and the grade in that course is considered (zero), but if the absence is due to illness or a compulsive excuse accepted by the dean of the college, then withdrawal grade will be recorded.
Academic Honesty	Philadelphia University pays special attention to the issue of academic integrity, and the penalties stipulated in the university's instructions are applied to those who are proven to have committed an act that violates academic integrity, such as: cheating, plagiarism (academic theft), collusion, and violating intellectual property rights.

Program Learning Outcomes to be Assessed in this Course

Number	Learning Outcome	Course Title	Assessment Method	Target Performance level
K_p1	Understand and recognize the biochemical, molecular and cellular structure of organisms and biological systems.	**Applied Molecular biology**	Comprehensive exam	%١٠٠ students will achieve 68% and more based on assessment rubric

Description of Program Learning Outcome Assessment Method

Number	Detailed Description of Assessment
Kp1	Comprehensive questions (10 marks included in the final exam)

Assessment Rubric of the Program Learning Outcome

criteria	score			
	4	**3**	**2**	**1**
Concept	The answers given indicate a thorough understanding of the concept	The answers given indicate a less comprehensive understanding of the concept	The answers given indicate misconceptions	The answers given indicate the student are not understand the concept
Comprehensive	The answers given indicate the ability to relate one information to another , comprehensively	The answers given indicate the ability to relate one information to another , partly	The answers given indicate less ability to relate one information to another	The answers given indicate not comprehensive
Language structure	The answers given in accurate ,short ,and clear sentences	The answers given in accurate and short sentences ,but clear	The answers given in short sentences , but not accurate nor clear	The answers are not given in accurate , short , and clear sentences